An analysis of the role of the science & technology parks in China's development of technological innovation

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Abstract: The aim of this study was to analyze the role of Chinese science & technology parks in the development of the country's technological innovation. Therefore, an integrative review was carried out in order to synthesize the existing literature considering theoretical and empirical studies. Thus, 17 articles were selected as the scope for the analysis. As a result, it can be understood that science & technology parks have enhanced the development of national high-tech industries and have fostered the creation of highly technological Chinese startups. Finally, it is concluded that the government through its policies has had a considerable influence on the creation and development of these zones. Such policies also serve as a way to contribute to regional development through the expansion of parks in provincial inland areas.

Keywords: China; Zones; Parks; Innovation; Technology.

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1 - Introduction

China's recent economic ascension is mainly a result of policies aimed at the development of national science, technology and innovation (S,T&I). They started in the 1980s and were driven by the central government in the mid-2000s (YANG; LEE; LIN, 2012). In fact, scientific and technological development has been strongly encouraged by the government since the controlled opening of the market, which was imposed by Deng Xiaoping in the early 1980s (JONGWANICH; KOHPAIBOON; YANG, 2014). In other words, innovation became central to the growth of a knowledge-driven economy (DOBSON; SAFARIAN, 2008).

As part of the strategy of revitalizing the country through science and education, the High-Tech Zones (HTZ) were established to support the creation and development of national technologies, by promoting an environment of industrialization of advanced technologies (GEBHARDT, 2013; BAI; YAN; CHIU, 2015; CHEN; LINK, 2018).

These zones, with a variety of levels and dimensions, are commonly known in the West as science & technology parks (STPs) (CHEN, 2018). STPs are places where multiple institutions such as universities, institutes of science and technology (ISTs), and companies are situated in, with the purpose to promote science, technology, innovation and entrepreneurship through planned actions (ANPROTEC, 2019).

China's science & technology parks have played, with a focus on high and new technology, a key role in China's economic boom in recent years (BAI; YAN; CHIU, 2015). These HTZs are mainly concentrated on the east coast, while up-country provinces still lack scientific and technological resources (JONGWANICH; KOHPAIBOON; YANG, 2014; BAI; YAN; CHIU, 2015).

This article has the objective to analyze, through a literature review, the role of the Chinese STPs in the development of technology innovation. About 30% of the studies regarding HTZs are focused on China and the United Kingdom (HOBBS; LINK; SCOTT, 2016). However, review articles particularly focused on Chinese ones were not found in our research.

Thus, this publication is structured as follows: beyond this Introduction, Section 2 brings the Theoretical Framework, Section 3 the method, Section 4 shows and discuss the results about the STPs operation as a way to contribute to regional development, their operation in China and the Chinese Science Parks, approaching the university role as well. Finally, Section 5 concludes the publication.

2 - Theoretical Framework

2.1 - Science & Technology Parks

Parks have been established worldwide as an instrument for economic advance, job creation and wealth generation in developed and emerging countries (RATINHO; HENRIQUES, 2010). An STP can be understood as an organization run by specialized professionals. Its objective is to increase the wealth of its community and promote the

culture of innovation, the competitiveness of companies members and the knowledge of institutions. (IASP, 2019).

Technology parks have the mission to provide the intelligence, infrastructure and necessary services for the growth and strengthening of technology-intensive enterprises (ANPROTEC, 2014). As such, STPs must make a significant contribution to consolidating the formation of a strong and competitive knowledge industry as well as adding technology and innovation to the established industrial, agricultural and service sector. Thus, technology parks are places of excellence for knowledge transfer and dissemination of technological innovation (CORREIA; GOMES, 2012; ANPROTEC, 2014).

Moreover, the science park has operational connections with knowledge-creation centers such as universities, ISTs and organizations. They have business support and technology transfer as their initiative, which encourages the establishment and incubation of knowledge-based, high-growth and innovation-based companies. This fosters an environment where large corporations can interact with a particular knowledge-creation center for mutual benefit (UKSPA, 2019).

Zammar, Kovaleski and Zanetti (2010) recognize STPs as an instrument that aims to transform knowledge into wealth, in which they must be constituted and structured with this clear and specific mission. Thus, the park is understood as fundamental for the creation of new businesses and technologies, and can be enhanced according to the mission, programs and projects of each region which it operates in.

2.2 - The development of S,T&I in China

China's rise from a mostly rural and isolated region to a world-leading in technology exportation in just three decades is certainly one of the most extraordinary economic transformations in history (WUTTKE, 2011; GEBHARDT, 2013). In this sense, Chinese technology-oriented policies are responsible for this transformation and have been increasingly supporting the growth of innovative industries (GUO; VERDINI, 2015). In China, the state provides grants, loans, and other stimulus (such as R&D tax

incentives, low income tax rates for high-tech companies) to drive innovation (WONGLIMPIYARAT, 2015).

This economic turnaround began in 1978, when Deng Xiaoping initiated the controlled deregulation of the agricultural sector (GEBHARDT, 2013; WONGLIMPIYARAT, 2015). The Torch Program (TP), implemented in 1988 by the Ministry of Science and Technology (MOST), was China's leading initiative on technological innovation (GEBHARDT, 2013; MOTOHASHI, 2013; WONGLIMPIYARAT, 2015; CHEN; LINK, 2018). One of the main strategies of the program is the creation and support of national STPs (GEBHARDT, 2013; MOTOHASHI, 2013; CHEN; LINK, 2018). In addition to these zones, the program supports the development of high-tech industries through the establishment of incubators, project financing and human resources training (JONGWANICH; KOHPAIBOON; YANG, 2014).

The TP was led by the university and therefore the promotion of STPs was also one of the program's main policies. Even though China's first science park, located in Shenzhen, was established in 1985, an increasing number of parks started to be spread in the country from 1988 onwards (CHENG et al., 2014). In these environments, a greater interaction between ISTs and companies is expected due to geographical proximity (KOSTER et al., 2018), in order to promote China's technological capacity (JONGWANICH; KOHPAIBOON; YANG, 2014; WONGLIMPIYARAT, 2015).

As soon as China joined the World Trade Organization (WTO) in 2001, the government launched a number of innovation policies to reach technology-leading countries, and intensified its efforts to attract foreign direct investment to support industries. Currently, one of the main policies of the Chinese MOST includes the national medium- and long-term program (NMLTP) for the development of science and technology during the period from 2006 to 2020 (MOTOHASHI, 2013; WONGLIMPIYARAT, 2015). The NMLTP maps China's transformation into an

innovation-driven economy. In addition, the 12th Five-Year S,T&I Development Plan (2011-2015) played a central role in the implementation of the NMLTP.

In recent Five-Year Plans, the Chinese Committee on Science, Technology and Education, which is the main body of central government on innovation, highlighted the strengthening of the science-technology base and modernization of the country's innovative skills. This plan puts the industrial focus on seven new emerging strategies, mirroring innovative sectors in the US and Europe (electric mobility, nanotechnology and green technologies are examples) to drive higher growth (GEBHARDT, 2013; JONGWANICH; KOHPAIBOON; YANG, 2014).

Other vehicles for Chinese development were the creation of ventures of Chinese and foreign companies, followed by production reallocations and later R&D facilities from overseas investor corporations in China. These policies were directed towards reducing technological gaps and modernizing state-owned enterprises and other institutional players. Foreign participation in these fields was a prerequisite to access the Chinese market (GEBHARDT, 2013; GUO; VERDINI, 2015).

In the early transition phase, technology parks used to be established in remote areas outside major cities. However, nowadays they are more and more integrated into the urban environment, serving as new subcenters in heavily centralized cities. Thus, it is believed that STPs cultivate environments that are more suited to knowledge-intensive use and thus increase competitiveness throughout the city (WUTTKE, 2011).

3. Method

The methodology used to achieve the proposed objectives is bibliographic and qualitative. Its purpose is to put the researcher in direct contact with everything that has been produced about a particular theme. Thus, it draws on a qualitative approach to content analysis, which is comprised of a set of interpretative techniques aimed to decode and describe the components of a complex system of meanings (MARCONI; LAKATOS, 2017). The bibliography consulted in this article consists of scientific and review articles

published after 2008, in order to consider only what was produced in the current context of the country.

The database chosen was Scopus, due to the greater range of results. The string ("China" AND ("Science park" OR "technology park")) was inserted and these filters were applied: descriptors in the Title, Abstract and Keywords; Scientific articles and Review articles; English and Chinese language. The abstracts were read and 30 articles were selected. Thus, after reading them entirely, 12 publications remained.

Considering the semantic discrepancy in the use of the terms "STPs" and "HTZs", we added another string to our search with the purpose of filling this gap. The string ("China" AND ("Tech" OR "Industry") AND "Zone") was inserted and the following filters were used: Title, Abstract and Keywords; Scientific articles and Review articles; English and Chinese language; "Economics Econometrics and finance", "Business, management and accounting" and "multidisciplinary" categories; As soon as the abstracts were read, 10 articles were selected and, after reading them entirely, 05 articles remained. To sum up, adding the both of the strings results altogether, a total of 17 articles were analyzed.

4 - Findings and Discussion

4.1 - An analisys of the selected articles

The titles of the articles, their authors and the purpose of each study were extracted from the 17 selected articles. Out of these, 05 were published in 2014, 03 in 2015 and 02 in 2019. Regarding the methodology, 12 articles are empirical, and 05 are theoretical. Therefore, the results of our research are in accordance with the preponderance of empirical articles mentioned by Hobbs, Link and Scott (2016) concerning publications on Chinese STPs. Table 1 presents the analyzed articles, their actors and the purpose of each article sorted by year of publication.

TABLE 1: SELECTED ARTICLES

Nº	Article Title	Author (s)	Objective(s) of the Article
1	From industrial enclaves to prototypes of the modern Chinese city: Development zones in Guangdong	Wuttke (2011)	This article aims to analyze the development of new zones in Guangdong.
2	High technology start-up innovation and the role of guanxi: an explorative study in China from an institutional perspective	Liu, Woywode and Xing (2012)	The publication has the purpose to understand the factors that influence high technology innovation in China.
3	Upgrading the Chinese Economy by Overhauling Special Economic Zones: Innovation Model Shopping or the Emergence of a Chinese Innovation Model?	Gebhardt (2013)	This article addresses an emerging model of Chinese innovation that applies elements of cluster theory and innovation systems, which approach the next stage of development of China's special economic zones.
4	The role of the science park in innovation performance of start-up firms: an empirical analysis of Tsinghua Science Park in Beijing	Motohashi (2013)	The publication empirically analyzes the determinants of startups at Tsinghua Science Park.
5	Science Parks and the Co-location of High-tech Small- and Medium-sized Firms in China's Shenzhen	Cheng et al. (2014)	This article aims to clarify the role of Chinese Science Parks.
6	China: the next innovation hot spot for the world	Haour and Jolly (2014)	The publication provides an overview of China's technology and innovation growth.

7	Optical Illusion? The Growth and Development of the Optics Valley of China	Miao and Hall (2014)	This publication aims to explore the characteristics of an embryonic local innovation system, built in a less favored region.
8	Anatomy of Tsinghua University Science Park in China: institutional evolution and assessment	Zou and Zhao (2014)	The article examines the institutional evolution of Tsinghua University Science Park; Assess TusPark's strengths and challenges.
9	Science park, triple helix, and regional innovative capacity: province-level evidence from China	Jongwanich, Kohpaiboon and Yang (2014)	This publication has the purpose to investigate the determinants of regional innovative capacity in China, paying particular attention to the role of science parks.
10	The role of geographical proximity in the establishment and development of science parks – evidence from Nanjing, China	Guo and Verdini (2015)	The article discusses the motivation and efficiency of geographical proximity in the development of the science park.
11	New economics of innovation: Strategies to support high-tech SMEs	Wonglimpiyarat (2015)	This article aims to explore China's new economic challenge regarding its innovation strategies to support high-tech small and medium enterprises.
12	Performance evaluation of China's Hi-tech zones in the post financial crises era - Analysis based on the dynamic network SBM model	Bai, Yan and Chiu (2015)	The publication has the purpose to assess the performance of national HTZs in China after the financial crisis.
13	Science and technology parks: an annotated and analytical literature review	Hobbs, Link and Scott (2017)	This article aims to summarize the literature on science & technology parks.
14	Employment in China's hi-tech zones	Chen and Link (2018)	The publication explores the employment differences over time in China's high-tech zones.

15	Technological entrepreneurship in science parks: A case study of Wuhan Donghu High-Tech Zone	Xie et al. (2018)	This article has the purpose to assess the performance of national ZDATs in China after the financial crisis.
16	Place-based policies, firm productivity, and displacement effects: Evidence from Shenzhen, China	Koster et al. (2018)	The publication examines the impact of open areas available due to the opening of science parks in Shenzhen.
17	Place-Based Policies, Creation and Agglomeration Economies: Evidence from China's Economic Zone Program	Lu, Wang and Zhu (2019)	This article aims to examine the incidence and effectiveness of a "place-based policy" in China: special economic zones.

Source: Made by the authors of this publication (2019).

Finally, it should be noted no publication examined in this research undertook a qualitative study on Chinese science & technology parks. From the decoding of articles aligned with the general objective, three categories were created: the performance of STPs in China; the performance of science parks specifically; and the role of HTZs as a way to contribute to regional development.

4.2 - The performance of High-Tech Zones in China

By implementing a significant number of high technology-related preferential policies and improving the service system, high-tech parks create industrial cluster advantages. Similarly, a favorable environment for attracting and integrating human resources, technologies, and capital accelerates China's high-tech industrialization (GEBHARDT, 2013; LU; WANG; ZHU, 2019). Furthermore, the parks offer R&D assistance to a number of industry 4.0-aligned companies including information technology (IT), materials science and engineering, biotechnology, sustainable energy, and automation (GUO; VERDINI, 2015).

To fuel this Chinese technology modernization strategy, S,T&I investment increased from US$ 11 billion to US$ 154 billion with an annual growth rate of 21%,

between 1995 and 2009. For example, the impact of this new strategy is clearly visible in the increase of R&D intensive Chinese products exportation. Although a high percentage of high-tech exports still come from foreign companies, this scenario is changing by means of STPs supporting the development of national technology (GEBHARDT, 2013), particularly through the creation of technology startups (JONGWANICH; KOHPAIBOON; YANG, 2014).

Therefore, even its main focus is to attracting potential high-tech industries and research centers, in addition to technology park networking, the policies trend is to support promising startups and other mechanisms that develop technological innovation (JONGWANICH; KOHPAIBOON; YANG, 2014). These startups receive training and workshops to overcome challenges in their early stages. Moreover, industry information and policies for high-tech entrepreneurs are given to them. Parks also act as intermediaries to facilitate startups to be able to work around intellectual property issues (LIU; WOYWODE; XING, 2012).

The role of Chinese incubators is to drive university research offers to the market. In this sense, incubator and university operations are often intertwined in a way that university laboratory facilities are used directly by the incubator. One of these includes an important part of the Beijing region, incorporating several universities and giving stimulus to incubated companies and startups (HAOUR; JOLLY, 2014).

Torch Program statistics indicate the importance of HTZs in the emerging Chinese economy. For example, their production increased by almost 20 times between 1997 and 2009. As an illustration, exports increased correspondingly from $ 6.479 billion in 1997 to $ 200.722 billion in 2009 (JONGWANICH; KOHPAIBOON; YANG, 2014).

High-tech companies located in parks often have an emphasis on innovative activity, R&D spending accelerated at an extraordinary rate between 2001 and 2006, having had an annual growth rate of 36.72% (JONGWANICH; KOHPAIBOON; YANG, 2014). As for patents, the number of applications grew by 20% per year. In 2011, according to the World Intellectual Property Organization (WIPO), China surpassed the United States of America: 526,000 patents were filed in China, 504,000 in the US and 343,000 in Japan (HAOUR; JOLLY, 2014).

In addition to policy measures of tax incentives, R&D grants, funding and strategic location, parks need companies that produce high-level technology. In order to meet this demand, technology parks employ stringent criteria to certify "high-tech enterprise". Thus, it is possible to define which firms are able to establish themselves in the parks (JONGWANICH; KOHPAIBOON; YANG, 2014). The parks are also evaluated and certified by the national government in reason to be classified. Top-performing parks receive political incentive and resource allocation priorities (CHENG et al., 2014).

As an example of the performance of Chinese technology parks, we illustrate the case of Donghu's HTZ, studied by Xie et al. (2018). In order to promote certain strategic industries, Donghu Park has built eight industrial technology R&D institutions. By 2015, incubated enterprises exceeded 200 and of these, a number of 110 completed the incubation for average sales revenue of US$ 58.6 million (XIE et al., 2018).

Donghu's HTZ total revenues reached US$ 121.1 billion in 2014 and exceeded US$ 150 billion in 2015. Therefore, technological innovation and business activities have effectively fostered business incubation, acceleration and growth. Interaction and communication between companies led to the formation of an intensive entrepreneurial community (XIE et al., 2018).

4.3 - The operation of Chinese Science Parks

China's first university science park, known as Northeastern University Science Park, was founded in 1989, even before the government launched the nationwide science park program. Since the 1990s, university science parks have multiplied. By 2014, there were 86 state university science parks, distributed in 24 provinces or municipalities across the country (ZOU; ZHAO, 2014).

In contrast to the Western notion that a science park can exist even in a single building, a Chinese park like Zhongguancun can occupy up to 100 square kilometers (GUO; VERDINI, 2015). Moreover, the growth trajectory of China's university science parks is different from that of Western societies. Most Chinese universities are public universities, which are heavily supported by the government. However, Chinese

universities are allowed to own and run university affiliated enterprises (GEBHARDT, 2013; ZOU; ZHAO, 2014).

Thus, the number of patents filed jointly by universities and companies has been increasing significantly since 1990. In 2010, 14% of Chinese S,T&I firms were run by universities, emphasizing the concept inherent in the triple helix model, and revealing increased university-enterprise cooperation with multinationals as well (GEBHARDT, 2013).

This ease of cooperation in the triple helix model has led many universities to establish science parks, with the purpose of owning university affiliated companies, commercializing research and incubating innovative startups. Thus, science parks have been widely acknowledged for their importance in the development of high-tech enterprises and industrial clusters, considered as a unique regional innovation system. Specifically, science parks offer their own context for sharing knowledge, skills and best practices within a geographic area, while promoting superior performance while integrating resources and collaborating with partners (ZOU; ZHAO, 2014; XIE et al., 2018). However, Wonglimpiyarat (2015) disagrees with this facilitated relationship in science parks, and mentions that although China has introduced several policies to support technology development, the process of technology transfer and commercialization is not yet completely successful due to some weak connections between university and industry.

However, the results reveal that university science parks produce knowledge and also create employments. For example, in 2010, on average, each of the state university science parks housed over 100 firms, generated US$ 93.5 million in income, and provided 3,800 jobs (ZOU; ZHAO, 2014). Those involved in STPs activities can receive R&D subsidies equivalent from 3 to 10 percent of their total sales. There is also an excellent infrastructure in these environments, with facilities such as schools, restaurants, post office, meeting places and supermarkets. Land policies are also different in these HTZs. Although all land in China is formally state-controlled, companies located in those areas generally enjoy exemptions from land use and other land-related fees. They are also exempt from taxes on built or purchased properties (KOSTER, et al., 2018).

Corporations have easier access to start-up funds and a special fund that was established exclusively for science and technology companies in science parks. This fund provides approximately US$ 1.5 million each year to Chinese startups and about twice of this amount for R&D activities. In addition, there is a simplified channel with government agencies that ensures their ability to obtain government services efficiently. Science park agencies also provide funding, management, administration and marketing services. The consequence is a growth in parks productivity by approximately 30%, compared to other areas. Moreover, the output of such firms increased by 15 to 25% due to science park policies (KOSTER, et al., 2018).

4.4 - The role of HTZs as a way to contribute to regional development

Reducing regional inequality is a challenge for the Asian country, since local support conditions vary significantly across regions of the country. Thus, there are less preconditions in the interior regions for creation of high-tech enterprise groups, as well as the difficulty in renewing the existing infrastructure (JONGWANICH; KOHPAIBOON; YANG, 2014).

Therefore, the high-tech R&D spending parks are mostly located in the eastern coastal areas such as Shandong, Guangdong, Jiangsu, Hebei, Beijing and Shanghai. These areas have rich scientific and educational resources, ensuring their research and development capacity. In turn, Hunan, Inner Mongolia, Guizhou, Fujian, Guangxi, Chongqing and Gansu are generally constrained by a lack of scientific and educational resources, hitherto incomplete scientific research systems, and insufficient qualities to attract talented workers (BAI; YAN; CHIU, 2015). To illustrate this inequality, R&D spends in Beijing was around US$ 7.8 billion in just one development zone. Hunan, an inland city with three development zones, spent US$ 1.6 billion on the sector (JONGWANICH; KOHPAIBOON; YANG, 2014). Although this may be true, the data is from 2008. Then, authors like Lu, Wang and Zhu (2019) suggests that nowadays, this discrepancy are being reduced as consequence of S,T&I policies.

Thus, increasing local competitiveness through regional policies is one of the main strategies of local governments (WUTTKE, 2011). As a way to reduce this

inequality, the Chinese government is transforming its traditional centralized political and administrative position into a service provider that proactively builds public-private partnerships (GUO; VERDINI, 2015). So, the construction of science & technology parks across the country is also, part of a strategy of regional decentralization and appointment of local authorities (LIU, WOYWODE; XING, 2012; JONGWANICH; KOHPAIBOON; YANG, 2014).

Therefore, while the central government provides guidelines for park construction and award national S,T&I projects (CHENG et al., 2014), local governments control fixed assets, finances, administration and infrastructure provision. Consequently, the practical administrative power over science parks becomes the responsibility of local governments (MIAO; HALL, 2014). Thus, most national HTZs, such as Zhongguancun Science Park and Ningbo Science Park, are guided by municipal governments (XIE et al., 2018).

As a solution to the problem of inequality between provinces, Jongwanich, Kohpaiboon and Yang (2014), mention that China should aggressively promote infrastructure development in the provinces of the interior. So, this would help the provinces gain more from science parks, as well as promote parity between provinces in the country.

In this way, the disparity between coastal and inland science parks can be gradually reduced. By setting up STPs in most provinces of the country to promote regional development (JONGWANICH; KOHPAIBOON; YANG, 2014), various industries could enjoy the benefits and the potential of high-tech companies in the park and consequently, the development of a new urban growth "machine" (GUO; VERDINI, 2015). In fact, the establishment of zones has been geographically balanced now (LU; WANG; ZHU, 2019).

Thus, China seeks to reduce regional disparities between the highly industrialized east coast and the west coast by expanding the creation of special economic zones (SEZs). It should be clarified that not all SEZs are parks, but all STPs are in a kind of SEZ ecosystem. In 2006, for example, of the 663 provincial-level Special Economic Zones were established in China, including 323 in coastal areas, 267 in central areas and 73 in the west. This sample is more representative of eventual spatial distribution than previous waves, as it includes 42% of China's SEZs. Those estimates are based on this sample,

then, have large-scale implications (LU; WANG; ZHU, 2019). Therefore, the disparity, while being balanced compared to the last decades, is still considerable. Even so, China is shifting its investment in special economic zones that draw traditional-sector industrial companies to regional 4.0 innovation-driven systems and HTZs (GEBHARDT, 2013).

In this regard, Wuttke (2011) highlights that firms that develop sophisticated technology have different demands for local factors. Thus, efforts to transform industrial monoculture development zones into fully equipped urban centers are part of strategies to create investment environments best suited for the development of a knowledge-driven economy. Allied to this, Wonglimpiyarat (2015) cites the importance of Chinese support in the development of high-tech small and medium enterprises, as a way to support the sustainable development of the country, increasing its innovation rates.

Even so, when China is analyzed, it is clear that its innovative activities are rapidly approaching advanced economies. For example, R&D expenditure relative to gross domestic product (GDP), which tripled from 0.57% in 1996 to 1.70% in 2009. This performance surpassed some countries of the Organization for Economic Cooperation and Development. (OECD) (JONGWANICH; KOHPAIBOON; YANG, 2014).

5 - Conclusion

By analyzing the publications, it is possible to see the influence exerted by the Chinese government on science & technology parks. Initiatives such as the Torch Program were created, involving the establishment of favorable environments and appropriate locations, along with the provision of appropriate incentives, the systematic introduction of foreign technology and incentives for human resources. Through policies (tax incentives, R&D grants, and financial assistance) and proximity to renowned universities and ISTs, they apply stringent criteria to certify that high-tech companies enter parks. Therefore, the positive networking effect of STPs tends to support technology-based startups and other technology diffusion mechanisms. As a result, high-tech firms located in parks often place greater emphasis on innovative activities.

Chinese universities are generally in the same ecosystem as STPs, and are strongly supported by the government and allowed to have affiliated companies. Business productivity in parks is approximately 30% higher. In addition, productivity increases by 15-20% as a result of park policies. These numbers suggest that companies in HTZs are more productive or, that parks attract more productive enterprises. Parks also effectively promote business incubation, acceleration and growth. As noted, by developing market-oriented institutions and providing resources, facilities, and services for startups and universities in STPs, firms would be more likely to invest in human and physical capital. Consequently, there is an improvement in technological and sustainable innovation.

The main findings of this study illustrate the relevance of government in the development of technological innovation in STPs. Chinese parks usually have exceptional infrastructures, providing facilities and services to support companies and universities in the development of technological innovation. Universities are often aligned with STPs, thus facilitating government orchestration of the ecosystem. It is also noticed that R&D activities increase in companies located in the parks. HTZs support firms in different ways, so they have a considerable influence on the development of technological innovation in China.

Our study has limitations, hence only Scopus database was used. Therefore, future studies may use China's National Knowledge Infrastructure (CNKI) to return a different range of articles. On the other hand, this study showed a considerable spectrum of publications on Chinese STPs indexed in an international database that we, western researches, were able to analyze without the resources to access the Chinese database.

Notas

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